



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/978,121	10/15/2001	Mark N. Kawaguchi	005794	3777
32588	7590	12/07/2004	ALRT/ETCH/CONE/	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			EXAMINER OLSEN, ALLAN W	
			ART UNIT	PAPER NUMBER
			1763	

DATE MAILED: 12/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/978,121

Applicant(s)

KAWAGUCHI ET AL.

Examiner

Allan Olsen

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 and 18-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 and 18-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections

All rejections in the Office action on May 5, 2004 are maintained and are repeated below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-16 and 18-27 are rejected under 35 U.S.C. 102(e) as being anticipated by the US Patent Application Publication of Qingyuan et al. (hereinafter, Qingyuan).

Qingyuan teaches using a downstream H₂/H₂O plasma to remove photoresist as well as the etching residue in a contact hole. Qingyuan teaches using a plasma comprising a major component of H₂ and a minor component of H₂O and the inclusion of N₂ and CF₄ (last line of Table III). Qingyuan teaches the contact holes are subsequently filled with metal ([0006], [0031]). Qingyuan teaches maintaining a wafer temperature of between room temperature and 450°C ([0024]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-8, 15, 16 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,403,436 issued to Fujimura et al. (hereinafter, Fujimura) in view of U.S. Patent 6,221,772 issued to Yang et al. (hereinafter, Yang).

Fujimura teaches a method by which photoresist is removed with a plasma comprising a major component of H_2 and a minor component of H_2O . Fujimura teaches using this same H_2/H_2O plasma to treat the surface of a metal before an overlying layer of metal is deposited thereon. Fujimura teaches that the by adding H_2O to an H_2 plasma, the rate of photoresist removal is substantially increased (col. 4, lns 64-68). Fujimura teaches heating the substrate-supporting pedestal electrode to a temperature of $200^\circ C$ (col. 3, ln 65). Fujimura teaches the capacitive coupling of the plasma excitation energy as well as the provision of microwave plasma excitation energy source (figure 2). Fujimura teaches applying RF bias power to the substrate (figure 2).

Fujimura does not teach removing the photoresist from a dielectric and forming a metal part adjacent to the dielectric layer without a wet clean following the removal of the photoresist.

Yang teaches an in-situ process wherein following the etching of a contact hole, a photoresist etch mask is removed and without a wet clean following the removal of the photoresist, a metal deposition fills the contact hole.

After etching a contact hole through a dielectric layer, it would be obvious to one skilled in the art to use Fujimura's method to remove the photoresist and then form a metal part adjacent to the dielectric layer without a wet clean following the removal of the photoresist because Yang teaches that it is highly desirable to proceed without an

intervening wet cleaning and Fujimura teaches that in addition to removing the photoresist the H_2/H_2O plasma prepares the metal that is exposed at the bottom of the contact hole for the subsequent deposition of metal into the contact hole.

Response to Arguments

Applicant's arguments filed September 10, 2004 have been fully considered but they are not persuasive. Applicant argues that Qingyuan does not teach a process:

"wherein the reactive gas mixture is primarily generated remotely from the substrate and substantially no ions are in the reactive gas mixture flowing within containing walls from the locations where they are generated to the substrate."

Applicant points to paragraph 0019 of Qingyuan which remakes reference to hydrogen ions and concludes that Qingyuan teaches away from the claimed invention. However, the examiner notes that Qingyuan teaches the use of a remotely generated plasma (paragraphs 0023, 0026) and Qingyuan teaches operating under a range of conditions such that an oxidizing, a reducing or a neutral plasma may be obtained.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M-F 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Greg Mills can be reached on 571-272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Allan Olsen
Primary Examiner
Art Unit 1763